

Amendments to the Claims:

This listing of claims replaces all prior versions and listings of claims in the application:

Listing of Claims:

1. (Cancelled)

2. (Currently Amended) ~~[The apparatus of claim 1, further comprising]~~ An apparatus for estimating the location of an area on a scintillator block, the apparatus comprising:

photodetectors disposed to receive photons from a scintillator block of a PET scanner and configured to provide a measured photodetector signal indicative of a distribution of photons detected by the photodetectors;

wavelength-shifting fibers disposed to receive photons from the scintillator block and configured to provide a measured fiber signal indicative of a distribution of photons received by the fibers; and

a processor configured to estimate, on the basis of both the measured photodetector signal and the measured fiber signal, a location of a discrete area on a surface of the scintillator block from which the photons emerge ~~[source-based on the measured photodetector signal and on the measured fiber signal].~~

3. (Currently Amended) The apparatus of claim 2, wherein the processor is configured to estimate a location of a discrete area ~~[of a photon source]~~ based on a reference photodetector signal.

4. **(Currently Amended)** The apparatus of claim 2, wherein the processor is configured to estimate a location of a discrete area [~~of a photon source~~] based on a reference fiber signal.
5. **(Original)** The apparatus of claim 2, wherein the processor is configured to estimate an extent to which the estimated location is the correct location.
6. **(Original)** The apparatus of claim 3, further comprising a stored calibration table containing values derived from the set of known photodetector signals.
7. **(Original)** The apparatus of claim 4, further comprising a stored calibration table containing values derived from the set of known fiber signals.
8. **(Currently Amended)** The apparatus of claim 2, wherein the processor is configured to estimate a location of a discrete area [~~of a photon source~~] by estimating the likelihood that the measured photodetector signal and the measured fiber signal resulted from photons emerging from the discrete area [~~emitted at the photon source~~].
9. **(Currently Amended)** The apparatus of claim 2, wherein the processor is configured to estimate a location of a [~~photon source~~] discrete area by:

estimating the likelihood that the measured photodetector signal and the measured fiber signal resulted from photons emerging from [~~emitted at~~] each of a plurality of discrete areas on the surface of the scintillator block [~~photon sources~~].
10. **(Currently Amended)** The apparatus of claim 9, wherein the processor is configured to estimate a location of a [~~photon source~~] discrete area by determining which of the [~~photon sources~~] discrete areas is associated with the maximum likelihood that the measured photodetector signal and the measured fiber signal resulted from photons emerging from that discrete area [~~emitted at that photon source~~].

11. (Currently Amended) The apparatus of claim 2, wherein the processor is configured to estimate a location of a ~~[photon source]~~ discrete area by:

estimating a first value indicative of a first likelihood, the first likelihood being the likelihood that the measured photodetector signal and the measured fiber signal resulted from photons ~~[emitted at]~~ emerging from a first ~~[photon source]~~ discrete area;

estimating a second value indicative of a second likelihood, the second likelihood being the likelihood that the measured photodetector signal and the measured fiber signal resulted from photons ~~[emitted at]~~ emerging from a second ~~[photon source]~~ discrete area;

determining, on the basis of the first and second values, that the first likelihood is greater than the second likelihood; and

designating the first ~~[photon source]~~ discrete area to be the ~~[photon source]~~ discrete area from which ~~[from which]~~ the photons that caused the measured photodetector signal and the measured fiber signal ~~[were emitted]~~ emerged.

12. (Cancelled)

13. (Currently Amended) ~~[The method of claim 12, further]~~ A method of estimating a location of a discrete area on the surface of scintillator block, the method comprising:

obtaining a measured photodetector signal indicative of a distribution of photons received by a plurality of photodetectors; and

obtaining a measured fiber signal indicative of a distribution of photons received by a plurality of wavelength-shifting fibers extending across the scintillator block;

on the basis of both the measured fiber signal and the measured photodetector signal,
estimating a location of a discrete area on the surface of [~~the photon source on~~] the
scintillator block from which the photons emerge [~~based on the measured~~
~~photodetector signal and on the measured fiber signal~~].

14. **(Currently Amended)** The method of claim 13, wherein estimating a location of the discrete area [~~of the photon source~~] comprises estimating the location based on a reference photodetector signal.
15. **(Currently Amended)** The method of claim 13, wherein estimating a location of the [~~most likely~~] discrete area [~~photon source~~] comprises estimating the location based on a reference fiber signal.
16. **(Original)** The method of claim 13, further comprising estimating an extent to which the estimated location is the correct location.
17. **(Original)** The method of claim 14, further comprising reading a stored calibration table containing values derived from the set of known photodetector signals.
18. **(Original)** The method of claim 15, further comprising reading a stored calibration table containing values derived from the set of known fiber signals.
19. **(Currently Amended)** The method of claim 13, wherein estimating a location of [~~the photon source~~] a discrete area comprises estimating the likelihood that the measured photodetector signal and the measured fiber signal resulted from photons [~~emitted at the photon source~~] emerging from the discrete area.
20. **(Currently Amended)** The method of claim 13, wherein estimating a location of a [~~photon source~~] discrete area comprises:

estimating the likelihood that the measured photodetector signal and the measured fiber signal resulted from photons ~~[emitted at]~~ emerging from each of a plurality of ~~[photon sources]~~ discrete areas.

21. (Currently Amended) The method of claim 13, wherein estimating a location of a ~~[photon source]~~ discrete area comprises:

identifying, from a plurality of ~~[photon sources]~~ discrete areas, a ~~[photon source]~~ discrete area having the property that the likelihood that the measured photodetector signal and the measured fiber signal resulted from photons ~~[emitted at]~~ emerging from that ~~[photon source]~~ discrete area is greater than the likelihood that the measured photodetector signal and the measured fiber signal resulted from photons ~~[emitted at]~~ emerging from a ~~[source]~~ a discrete area other than that ~~[photon source]~~ discrete area.

22. (Currently Amended) The method of claim 13, wherein estimating a location of a ~~[photon source]~~ discrete area comprises:

estimating a first value indicative of a first likelihood, the first likelihood being the likelihood that the measured photodetector signal and the measured fiber signal resulted from photons ~~[emitted at]~~ emerging from a first ~~[photon source]~~ discrete area;

estimating a second value indicative of a second likelihood, the second likelihood being the likelihood that the measured photodetector signal and the measured fiber signal resulted from photons ~~[emitted at]~~ emerging from a second ~~[photon source]~~ discrete area;

determining, on the basis of the first and second values, that the first likelihood is greater than the second likelihood; and

designating the first [~~photon source~~] discrete area to be the [~~photon source~~] discrete area from which [~~from which~~] the photons that caused the measured photodetector signal and the measured fiber signal [~~were emitted~~] emerged.

23. (Currently Amended) A computer-readable medium having encoded thereon software for estimating a location of a [~~most likely photon source~~] discrete area on the surface of a scintillator block, the software comprising instructions for:

obtaining a measured photodetector signal indicative of a distribution of photons received by a plurality of photodetectors [~~from a photon source on a scintillator block~~];

obtaining a measured fiber signal indicative of a distribution of photons received by a plurality of wavelength-shifting fibers extending across the scintillator block [~~from a photon source on a scintillator block~~]; and

estimating, on the basis of both the measured photodetector signal and the measured fiber signal, a location of a discrete area on the surface of the scintillation block from which the photons [~~most likely~~] emerged [~~photon source on the scintillator block at least in part on the basis of the measured photodetector signal and at least in part on the basis of the measured fiber signal~~].

24. (Currently Amended) The computer-readable medium of claim 23, wherein the instructions for estimating a location of a [~~most likely photon source~~] discrete area comprise instructions for comparing the measured photodetector signal with a set of known photodetector signals and comparing the measured fiber signal with a set of known fiber signals.

25. (Original) The computer-readable medium of claim 24, wherein the software further comprises instructions for reading a stored calibration table containing values derived from the set of known photodetector signals.

- 26. (Original)** The computer-readable medium of claim 24, wherein the software further comprises instructions for reading a stored calibration table containing values derived from the set of known fiber signals.
- 27. (Currently Amended)** The computer-readable medium of claim 23, wherein the instructions for estimating a location of a [~~most-likely photon source~~] discrete area comprise instructions for estimating the likelihood that the measured photodetector signal and the measured fiber signal resulted from photons [~~emitted at~~] emerging from the [~~most-likely photon source~~] discrete area.
- 28. (Currently Amended)** The computer-readable medium of claim 23, wherein the instructions estimating a location of a [~~most-likely photon source~~] discrete area comprise instructions for:
- estimating the likelihood that the measured photodetector signal and the measured fiber signal resulted from photons [~~emitted at~~] emerging from each of a plurality of [~~photon sources~~] discrete areas; and
- determining which of the plurality of [~~photon sources~~] discrete areas is associated with the maximum likelihood that the measured photodetector signal and the measured fiber signal resulted from photons [~~emitted at~~] emerging from that [~~photon source~~] discrete area.
- 29. (Currently Amended)** The computer-readable medium of claim 23, wherein the instructions for estimating a location of a [~~most-likely photon source~~] discrete area comprise instructions for:
- estimating the likelihood that the measured photodetector signal and the measured fiber signal resulted from photons [~~emitted at~~] emerging from [a] each of a plurality of [~~photon sources~~] discrete areas; and

identifying, from the plurality of [~~photon sources~~] discrete areas, a most-likely [~~photon source~~] discrete area having the property that the likelihood that the measured photodetector signal and the measured fiber signal resulted from photons [~~emitted at~~] emerging from that [~~the most-likely photon source~~] discrete area is greater than the likelihood that the measured photodetector signal and the measured fiber signal resulted from photons [~~emitted at~~] emerging from a [~~source~~] discrete area other than the most-likely discrete area [~~photon source~~].